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(54) Titre: PROCEDE, ENSEMBLE ET ENDUIT COMPLEMENTAIRE DE CONSTRUCTION DE SECOND ŒUVRE

(57) Abstract

A non-structural work method wherein prefabricated flat elements, particularly plates, are provided which comprise a plaster body and at least one paper facing sheet with at least one outer layer having an exposed outer surface ready for decoration, as well as at least one complementary jointing plaster particularly suitable for finishing a joint; and said flat elements are assembled, particularly by means of a plaster, whereafter the joints are finished using said complementary plaster to form an exposed outer surface that is relatively uniform even at the joints. The structure and/or composition of the paper facing sheet and the composition of the complementary plaster are adjusted in relation to one another so that when the complementary plaster has dried, a surface having one or more substantially uniform physical properties, including colour or shade, is achieved over the whole of said surface, and particularly on the exposed outer surface of the joints.

(57) Abrégé

Procédé de construction de second œuvre, selon lequel on dispose, d'une part, d'éléments plats préfabriqués, notamment des plaques, comportant un corps de plâtre et au moins une feuille de papier de parement, dont au moins une couche externe présente une face extérieure apparente, prête à être décorée, et d'autre part, d'au moins un enduit complémentaire de jointoiement pouvant être utilisé notamment pour la finition d'un joint et on assemble lesdits éléments plats entre eux, notamment avec un enduit, et on finit les joints avec ledit enduit complémentaire, de manière à obtenir une surface d'ensemble extérieure et apparente, relativement uniforme, y compris au niveau des joins et, la structure et/ou la composition de la feuille de papier de parement, et la composition de l'enduit complémentaire étant ajustées l'une par rapport à l'autre pour obtenir, à l'état sec de l'enduit complémentaire, une surface d'ensemble présentant une ou plusieurs caractéristiques physiques, dont la couleur ou teinte, sensiblement homogènes dans pratiquement toute la surface d'ensemble, y compris au niveau de la face extérieure apparente des joints.

A METHOD FOR THE CONSTRUCTION OF WALLS OR CEILINGS OF A BUILDING

The present invention relates to a method and kit for the construction of walls or ceilings of a building. In particular, the invention relates to, on the one hand, flat prefabricated elements, especially plasterboards, comprising a plaster body with at least one sheet of lining paper being a visible surface ready to be decorated and on the other hand, a joint-pointing coat for filling and finishing joins formed between flat prefabricated elements arranged side by side. The flat prefabricated elements arranged side by side are attached to the structural frames of buildings, such as studs by the use of a joining compound, the joins between the flat prefabricated elements are subsequently competed by the joint-pointing coat to produce outer surfaces, for example ceilings and walls of a building. The outer surfaces of the above described kind may also be used to form partitions to define spaces within a building.

According to the document EP-A-0, 521, 804, the lining paper may comprise an upper layer, called an upper web, comprising white cellulose fibres, mainly synthetic, and a mineral filler of light colour, preferably white, and a pigment layer covering the upper layer, comprising a mineral filler of light colour, preferably white, and a binder.

The outer surfaces formed from known building materials usually require preparation because of shade or colour differences between the lining paper of the flat prefabricated elements and the coating material before receiving any final surface decoration such as paint, lacquers or wall paper.

The preparation step represents an appreciable

additional cost in the construction of a building. And in some cases, the preparation step is still insufficient for obtaining an overall decorated surface of uniform appearance, particularly in view of the physico-mechanical differences prevailing between the joins, on the one hand, and the flat prefabricated elements, on the other hand.

The object of the present invention is to alleviate the above mentioned disadvantages. More specifically, it is an object of the present invention to avoid the need for the preparation of the outer surfaces, before any final decoration of the outer surfaces.

According to the present invention there is provided a method for the construction of walls or ceilings of a building, the method including the steps of:

(a) providing flat prefabricated plasterboards having a plaster body and a sheet of lining paper, the lining paper including an upper layer and a pigment layer, the upper layer including white cellulose fibres and/or a mineral filler and the pigment layer including a mineral filler and a binder;

(b) providing a joining compound for assembling said plasterboards;

(C) providing a joint-pointing coat for finishing joins between said plasterboards, the joint-pointing coat having a mineral filler and a binder, wherein at least one parameter of:

(i) the reflectance factor, and
(ii) the surface water absorption

of the joint-pointing coat in the dry state is

substantially matched with a corresponding parameter of the upper layer and/or pigment layer of the lining paper; and

(d) assembling the plasterboards together with the joining compound and applying the joint-pointing coat to finish the joins and thereby form an overall outer surface having the or each parameter substantially homogeneous over the entire outer surface, including the upper layer and/or pigment layer of the plasterboard and an outer face of the dried joint-pointing coat.

Accordingly, one of the decisive advantages provided by the present invention is that when the surface absorption and/or reflectance factor of the lining paper and of the joint-pointing coat are homogenised, a virtually perfect appearance of a paint layer or paint layers can be obtained, and also a virtually uniform and homogenous adhesion of a wallpaper can be achieved.

Moreover, the present invention is more preferably characterized in that, in addition to the surface water absorption and/or reflectance factor, the decolouration or colouration of the lining paper of the plasterboard and the joint-pointing coat in a dry state are substantially homogenised.

Preferably the various physical characteristics can be defined as follows:

- the reflectance factor of the overall surface, including that of the visible outer face of the joins, ranges from 70% to 80%, and preferably ranges from 72% to 76%, for a wavelength of 457 nm;
- the decoloration or coloration of the overall surface, including that of the visible outer face of the joints, has a colour deviation (delta E*) at most equal to 3 after exposure for 72 hours to a source of UV radiation arranged at 15 cm from the surface and having a wavelength at least equal to 290 nm;
- the surface water absorption of the overall surface,

including that of the visible outer face of the joints, is not less than 60 minutes and/or is at most equal to 15 g/m^2 according to the COBB test, at 23°C.

Preferably, the joint-pointing coat contains a light coloured miner killer, preferably white, and has a grain size ranging from 5 to 36mm.

In practice, and by means of routine tests, the average person skilled in the art knows how to coordinate the structure and/or composition of a sheet of lining paper and/or the composition of a joint-pointing coat, so as to satisfy the above-defined technical principles, in such a way that the examples described below are in no way limiting.

The preferred embodiment of the present invention will now be described by taking flat prefabricated elements, for example plasterboards. The plasterboards are typically composed of a factory plaster-cast body between two sheets of paper providing both lining and reinforcement.

Conventionally, one of the sheets of paper used for making the plasterboards has a dark colour which can vary between a grey colour and a chestnut colour, since it is composed of cellulose fibres which have not under gone any particular purifying treatment. Traditionally, this so-called grey paper is obtained from unbleached chemical pulp and/or from mechanical pulp and/or from thermomechanical pulp and/or from semi-chemical pulp. The term mechanical pulp usually means a pulp obtained entirely by mechanical means from various raw materials, essentially wood, and other recycled products originating from wood, such as old cardboard boxes, trimmings of kraft paper and/or old newspapers. The term thermomechanical pulp means a pulp obtained by thermal treatment followed by a mechanical treatment of the raw material. The term semi-chemical pulp means a pulp obtained by eliminating some of the non-cellulose components from the raw material by means of chemical treatment followed by a subsequent mechanical

treatment in order to disperse the fibres.

The other sheet has a visible face, called a lining face, of a colour generally lighter than the grey sheet. To obtain this lighter colour, the layer or layers of this face are based on chemical pulp, if appropriate bleached, composed of recycled and/or new cellulose fibres, and/or on mechanical pulp, if appropriate bleached. The term chemical pulp means a pulp obtained by eliminating a very large proportion of the non-cellulose components from the raw material by chemical treatment, for example, by cooking in the presence of suitable chemical agents, such as soda or bisulphites. The chemical treatment is completed by a bleaching step. In the bleaching step a large portion of coloured unbleachable substances are eliminated, together with substances which may decomposed with age and giving unpleasant yellow shades associated with the presence of, for example, lignin.

In a preferred embodiment of the present invention, and according to the document EP-A-0 521 804, the content of which is incorporated in the present description, the lining paper includes an upper layer, called an upper web, comprising white cellulose fibres, mainly synthetic, a mineral filler of light colour, preferably white, and a pigment layer covering the upper layer, likewise including a mineral filler of light colour, preferably white, and a binder.

According to the preferred embodiment of the present invention, the coating includes a mineral filler of light colour, preferably white, and a small grain size ranging from 5 to 35 µm. The small grain size of the mineral filler makes it possible to obtain a smooth surface corresponding to that of the lining of the board. A grain size that is too large gives rise to overall surface defects, such as light reflection on the surface of the coating which is different from that on the surface of the board, causing differences in tone and brightness of the shade. Too large a grain size also gives rise to

differences in physical appearance which are associated with the differences in roughness between the board and the coating.

The mineral filler represents preferably 50% to 85% of the total weight of the additional coating.

Moreover, the coating may include a hydrophobic agent, for example 0.2% to 5%, and preferably 0.5% to 3%, of the total weight of the coating, for example a silicone derivative. The hydrophobic agent provides a slowing of the drying kinetics of the coating, this being conducive in avoiding cracking while the coating dries and also increasing resistance to steam during operations such as the removal of wallpaper, this being achieved without thereby impairing the adhesion of a paint or wallpaper on the overall surface, including adhesion to the visible surface of the joins. The hydrophobic agent also minimizes any disparity between the absorbent capacities of the surfaces of the coating and of the lining paper of the flat prefabricated elements. Thus, all paints or wallpaper applied to the overall surface exhibit similar absorption kinetics on the coating and the lining paper, thus making it possible to avoid the appearance of different colouration or shade over the entire outer surface.

The coating also includes an organic binder dispersible in aqueous solution, in an amount of ranging from 1 to 20%, and preferably ranging from 2 to 12%, of the total weight of the coating. An example of a suitable organic binder are polyvinyl acetates and/or acrylic acid esters. Selecting an organic binder is important because it must impart sufficient flexibility to the coating to withstand mechanical stresses, and it must have both an adhesive capacity to bond well to the overall surface and provide good resistance to the harmful effects of UV light.

Moreover, a handling agent is provided in the composition of the coating, especially a water-retaining and thickening agent, for example methylhydroxyethylcellulose, in a proportion of 1 to 15%,

and preferably of 2 to 12%, of the total weight of the

coating.

Finally, at least one slipping agent can be included in the composition of the coating, especially clays, in the proportion of 0.1 to 2%, and preferably of 0.1 to 0.6%, of the total weight of the coating. The clays are preferably silicate derivatives and more preferably clays of the attapulgite type.

Other components, such as biocides, dispersants, anti-foaming agents and pigments can also be incorporated in the composition of the coating in the conventional way.

The invention may be understood better from the following detailed example, but is by no means a limitation

Plasterboards similar to those in Example 5 of document EP-A-0 521 804, are assembled by means of a conventional sealing joint coating, for example a joint coating sold under the registered trade mark of "PREGYLYS"® of the Company PLATRES LAFARGE. The upper web of the lining of the board is obtained from 65% bleached synthetic cellulose fibres and 35% talcum and is covered with a pigment layer comprising, as mineral filler, 85% by weight of $CaSO_4$, $2H_2O$ in the form of needles of a length of between 3 and 5 µm and, as a binder, 10.3% by weight of styrene-butadiene copolymer. The sealing joint coating subsequently receives a thin layer of a coating according to the invention, having the following composition:

- 50 to 85% by weight of calcium carbonate, grain size from 5 to 35 µm, as a mineral filler;
- 2 to 12% by weight of a binder comprising polyvinyl acetates and acrylic acid esters in aqueous solution;
- 0.5 to 3% by weight of a silicone derivative as a hydrophobic agent;
- 0.1 to 0.9% of a cellulose derivative of the methylhydroxyethylcellulose type;
- 0.1 to 0.6% of a slipping agent of the attapulgite type;
- 1 to 12% of another silicate derivative as an additional slipping agent;
- 0.1 to 5% of a polycarboxylic acid ammonium salt as a

dispersant;
- 0.001 to 0.015 of an iron oxide as a pigment;
- 0.1 to 0.3% of a preparation of N-formoles and isothiazolinones as a biocide;
- 0.1 to 0.3% of a conventional anti-foaming agent;
- water up to 100%.

The weight percentages given are in relation to the total weight of the coating, unless indicated otherwise.

The characteristics of the two overall surfaces thus formed are compared by applying the following tests:

(A) Degree of whiteness or reflectance factor , R, is measured with a wavelength of 457 nm. This degree represents the percentage ratio between of a reflected radiation of the body in question and that of a perfect diffuser under the same conditions.

(B) Surface water absorption measured, for example, according to the COBB test. In this test, a ring defining an area of 100 cm^2 is filled with distilled water at 23°C to a height of approximately 10 mm. The water is left in contact with the overall surface forming the bottom of the ring for one minute, and then the water is emptied and the excess spin-dried. The weight gain of the surface is subsequently calculated per square metre of surface area. In an alternative version, a drop of distilled water of a volume of approximately 0.05 cm^3 at 23°C is deposited on the surface. It is important that the drop be deposited and not allowed to fall from a variable height to avoid the drop splashing to a greater or lesser extent, thus falsifying the result. The duration in minutes represents the surface absorption of the tested area.

(C) UV radiation resistance is measured by exposing the overall surfaces, in a cabinet comprising eight high pressure mercury vapour lamps, each of 400 watts, to a wavelength which is not less than 290 nm. The surfaces are maintained at a distance of 15 cm from

the lamps and at a temperature of 60°C for 72 hours. The colour deviations, delta E*, are measured on a spectrocolorimeter. The spectrocolorimeter measures the variables L*, a*, and b* in which L* is the luminance, a* represents the transition from green to red, and b* represents the transition from blue to yellow. E* is a function of L*, a*, and b*, and defines the colorimetry of a sample and the deviation is measured in relation to a reference point. Generally, a colour deviation beyond 2 becomes discernible to the naked eye.

The results of the tests (A) and (B) are collated in Table I and those of the test (C) are collated in Table II below.

Table I

	Standard overall surface	Overall surface according to the invention
Reflectance R (%)	Board: 50 to 60 Coat: 65 to 85	Board: 72 to 76 Coat: 72 to 76
Absorption COBB (g/m^2) Alternative (min)	19 Board: 50 Coat: 15	13 Board: >= 60 Coat: >= 60

This shows that the overall surface according to the present invention is clearly more homogeneous than that of an assembly according to the conventional technique. Moreover, the more homogeneous absorption time of the overall surface makes it possible to use a paint having less covering capacity than that necessary with traditional boards and coats and is also beneficial to the painting operation.

Table II

Before Exposure	Standard	Invention
Initial measurements of the board	$L^* = 82.94$ $a^* = -0.43$ $b^* = 4.64$	$L^* = 90.41$ $a^* = -0.03$ $b^* = 3.13$
Initial measurements of the joint	$L^* = 90.70$ $a^* = 0.73$ $b^* = 5.28$	$L^* = 89.70$ $a^* = 0.50$ $b^* = 3.60$
	Board/Joint colour deviation delta $E^* = 7.87$	Board/Joint colour deviation delta $E^* = 1$
Exposure to UV for 72 hours		
Measurements of the board after exposure	$L^* = 81.10$ $a^* = 0.69$ $b^* = 12.93$	$L^* = 90.38$ $a^* = -0.91$ $b^* = 7.40$

Before Exposure	Standard	Invention
	Colour deviation delta E* = 8.56; very substantial yellowing plus chestnut spots	Colour deviation delta E* = 4.36; substantial yellowing
Measurements of the joint after exposure	L* = 88.90 a* = 0.91 b* = 3.83	L* = 89.17 a* = 0.50 b* = 3.19
	Colour deviation delta E* = 2.32; slight yellowing plus a few chestnut spots	Colour deviation delta E* = 0.67; very slight colour deviation

This table shows that the colour deviation before exposure to UV is much slighter for an overall surface according to the invention than for an overall surface such as is obtained traditionally.

This table also shows that the change in the colour deviation after exposure to UV is much less pronounced in the overall surface according to the invention than traditionally. In fact, the colour deviation before exposure and after exposure must be as little as possible, so that the overall surface does not give the impression to the naked eye of being spotted or being covered with zones of different shade and brightness.

This is not possible with an overall surface obtained by means of traditional plasterboards and products, but the very slight deviation of the overall surface according to the invention makes it possible to mitigate this disadvantage.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for the construction of walls or ceilings of a building, the method including the steps of:

(a) providing flat prefabricated plasterboards having a plaster body and a sheet of lining paper, the lining paper including an upper layer and a pigment layer, the upper layer including white cellulose fibres and/or a mineral filler and the pigment layer including a mineral filler and a binder;

(b) providing a joining compound for assembling said plasterboards;

(c) providing a joint-pointing coat for finishing joins between said plasterboards, the joint-pointing coat having a mineral filler and a binder, wherein at least one parameter of:

(i) the reflectance factor, and
(ii) the surface water absorption

of the joint-pointing coat in the dry state is substantially matched with a corresponding parameter of the upper layer and/or pigment layer of the lining paper; and

(d) assembling the plasterboards together with the joining compound and applying the joint-pointing coat to finish the joins and thereby form an overall outer surface having the or each parameter substantially homogeneous over the entire outer surface, including the upper layer and/or pigment layer of the plasterboard and an outer face of the dried joint-pointing coat.

2. The method according to claim 1, wherein the reflectance factor of the joint-pointing coat is adjusted by the grain size of the mineral filler.

3. The method according to claim 2, wherein the mineral filler of the joint-pointing coat has a grain size in the range of 5 to 35µm

4. The method according to claim 1, wherein the surface water absorption of the joint-pointing coat is adjusted by introducing a hydrophobic agent into the composition of said joint pointing coat.

5. The method according to claim 4, wherein the joint-pointing coat composition includes hydrophobic agent in an amount ranging from 0.2 to 5 % of the weight of joint-pointing coat.

6. The method according to claim 5, wherein the joint-pointing coat composition includes hydrophobic agent in an amount ranging from 0.5 to 3 % of the weight of joint-pointing coat.

7. The method according to claim 1, wherein the binder is organic and in a proportion ranging from 1 to 20 % of the weight of the joint-pointing coat composition.

8. The method according to claim 7, wherein the binder is in a proportion ranging from 2 to 12 % of the weight of the joint-pointing coat composition.

9. The method according to claim 1, wherein the reflectance factor of the overall surface, including that of an outer face of the dried joint-pointing coat, is in the range of 70% to 80 %, for a wavelength of 475nm.

10. The method according to claim 9, wherein the

reflectance factor is in the range of 72% to 76%.

11. The method according to claim 1, wherein the surface water absorption of the overall surface, including that of the outer face of the dried joint-pointing coat, is not less than 60 minutes and/or is at most equal to 15 g/m2 to the COBB test, at 23°C

12. The method according to claim 1, wherein the decolouration or colouration under the effect of natural light of the upper layer and/or pigment layer of the lining paper is substantially matched with the corresponding decolouration or colouration of the joint-pointing coat in the dry state, such that when the plasterboards are assembled together with the joining compound and the joins finished with the joint-pointing coat, an overall outer surface having substantially homogeneous decolouration or colouration over the entire outer surface of the panel, including the upper layer and/or pigment layer of the plasterboard and the outer face of the dried joint-pointing coat.

13. The method according to claim 11, wherein the decolouration or colouration of the overall surface, including that of the outer face of the dried joint-pointing coat, has a colour deviation (delta E*)at most equal to 3 after exposure for 72 hours to a source UV radiation arranged at 15 cm from the surface and having a wavelength at least equal to 290nm.

14. A kit for the construction of walls or ceilings of a building, including flat prefabricated plasterboards, a joining compound, and a joint-pointing

coat, as defined in claim 1 or 11.

Dated this 23rd day of February 2000
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